

% Celsius Content	CTE
5	8.1
25	7.4
95	5.2

This invention may be embodied in other forms or carried out in other ways without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered as in all respects illustrative and not restrictive, the scope of the invention being indicated by the appended claims, and all changes which come within the meaning and range of equivalency are intended to be embraced therein.

What is claimed is:

1. A method for preparing an article comprising the steps of:

providing a substrate comprising silicon; and

applying a gaseous species of Si inhibiting barrier layer to the substrate wherein the barrier layer has a crystallographic structure which is at least 5.0% by volume celsian and inhibits the formation of a gaseous species of Si when the article is exposed to a high temperature, aqueous environment and wherein the coefficient of thermal expansion of the barrier layer is within  $\pm 3.0$  ppm/ $^{\circ}$  C. the coefficient of thermal expansion of the substrate.

2. A method according to claim 1 wherein the coefficient of thermal expansion of the barrier layer is within  $\pm 0.5$  ppm/ $^{\circ}$  C. the coefficient of thermal expansion of the substrate.

3. A method according to claim 1 further including the step of grit blasting the substrate prior to applying the barrier layer.

4. A method according to claim 3 including grit blast with alumina particles having a particle size of  $\leq 30$  microns.

5. A method according to claim 4 including grit blasting at a velocity of about 150/m/sec to about 200/m/sec.

6. A method according to claim 1 including applying the barrier layer by thermal spraying.

7. A method according to claim 6 including thermal spraying while holding the substrate at a temperature of between about 870 $^{\circ}$  C. to 1200C.

8. A method according to claim 1 including the step of preoxidizing the substrate to form a layer of SiO<sub>2</sub> prior to applying the barrier layer.

9. A method according to claim 8 wherein the preoxidizing comprises heating the substrate at a temperature of between about 800 $^{\circ}$  C. to 1200 $^{\circ}$  C. for about 15 minutes to 100 hours.

10. A method according to claim 8 wherein the coefficient of thermal expansion of the barrier layer is within  $\pm 0.5$  ppm/ $^{\circ}$  C. the coefficient of thermal expansion of the substrate.

11. A method according to claim 1 including the step of, after applying the barrier layer, heat treating the article at a temperature of about 1250 $^{\circ}$  C. for about 24 hours.

12. A method according to claim 1 including heat treating at a temperature of about 12500 $^{\circ}$  C. for about 24 hours.

13. A method for preparing an article comprising the steps of:

providing a substrate comprising silicon;

5 grit blasting the substrate with particles having a particle size  $\leq 30$  microns and applying a gaseous species of Si inhibiting barrier layer to the substrate wherein the barrier layer inhibits the formation of a gaseous species of Si when the article is exposed to a high temperature, aqueous environment.

14. A method for preparing an article according to claim 13 wherein the particles are alumina particles.

15. A method according to claim 13 or claim 14 including grit blasting at a velocity of about 100/m/sec to about 200/m/sec.

16. A method according to claim 1 or 13 wherein the barrier layer comprises from about 0.00 to 1.00 moles BaO, from about 0.00 to 1.00 mole SrO, about 1.0 mole Al<sub>2</sub>O<sub>3</sub> and about 2.00 mole SiO<sub>2</sub>, wherein the total of BaO and SrO is about 1.00 mole.

17. A method according to claim 1 or wherein the barrier layer consists essentially of from about 0.00 to 1.00 mole BaO, from about 0.00 to 1.00 mole of an oxide of a second alkaline earth metal, about 1.00 mole Al<sub>2</sub>O<sub>3</sub> and about 2.00 mole SiO<sub>2</sub>, wherein BaO plus the other alkaline earth metal oxide total 1 mole.

18. A method according to claim 1 or 13 wherein the barrier layer comprises from about 0.10 mole to about 0.90 mole BaO and from about 0.10 mole to about 0.90 mole SrO.

19. A method according to claim 1 or 13 wherein the barrier layer comprises from about 0.25 mole to about 0.75 mole BaO and from about 0.25 mole to about 0.75 mole SrO.

20. A method according to claim 1 or 13 wherein the barrier layer comprises about 0.75 mole BaO and about 0.25 mole SrO.

21. A method for preparing an article comprising the steps of:

providing a substrate comprising silicon;

oxidizing the substrate to form a layer of SiO<sub>2</sub>;

applying a gaseous species of Si inhibiting barrier layer to the oxidized substrate wherein the barrier layer inhibits the formation of gaseous species of Si when the article is exposed to a high temperature, aqueous environment.

22. A method according to claim 21 wherein the preoxidizing comprises heating the substrate at a temperature of between about 800 $^{\circ}$  C. to 1200 $^{\circ}$  C. for about 15 minutes to 100 hours.

23. A method according to claim 21 wherein the coefficient of thermal expansion of the barrier layer is within  $\pm 3.0$  ppm/ $^{\circ}$  C. the coefficient of thermal expansion of the substrate.

24. A method according to claim 21 wherein the coefficient of thermal expansion of the barrier layer is within  $\pm 0.5$  ppm/ $^{\circ}$  C. the coefficient of thermal expansion of the substrate.

25. A method according to claim 21 wherein the barrier layer has a crystallographic structure which is at least 50% by volume celsian.

26. A method for preparing an article comprising the steps of: